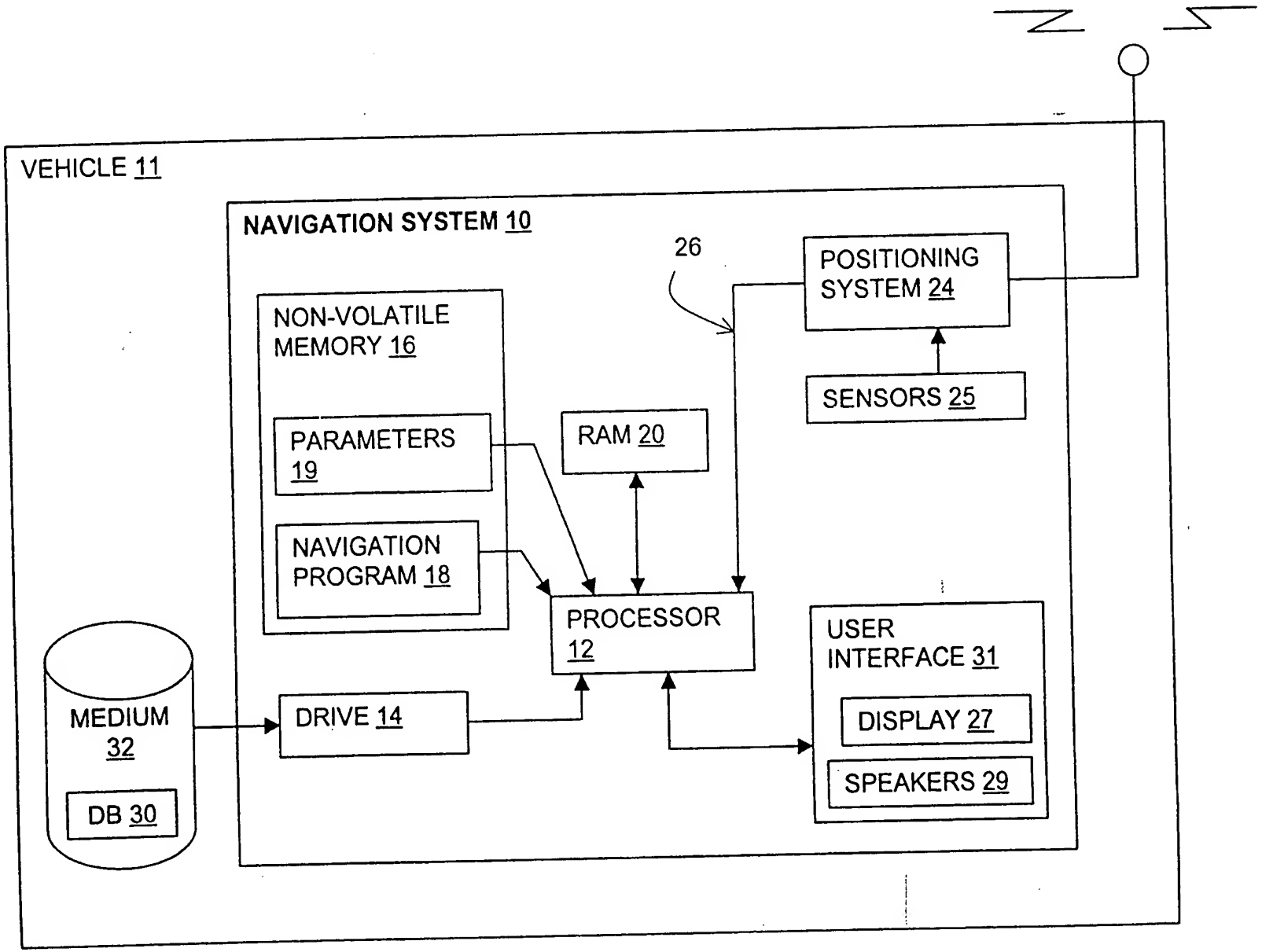
FIG. 1


VEHICLE 11
NAVIGATION SYSTEM 10
26
POSITIONING SYSTEM 24
NON-VOLATILE MEMORY 16
SENSORS 25
PARAMETERS 19
RAM 20
NAVIGATION PROGRAM 18
PROCESSOR 12
USER INTERFACE 31
DISPLAY 27
SPEAKERS 29
MEDIUM 32
DB 30
DRIVE 14

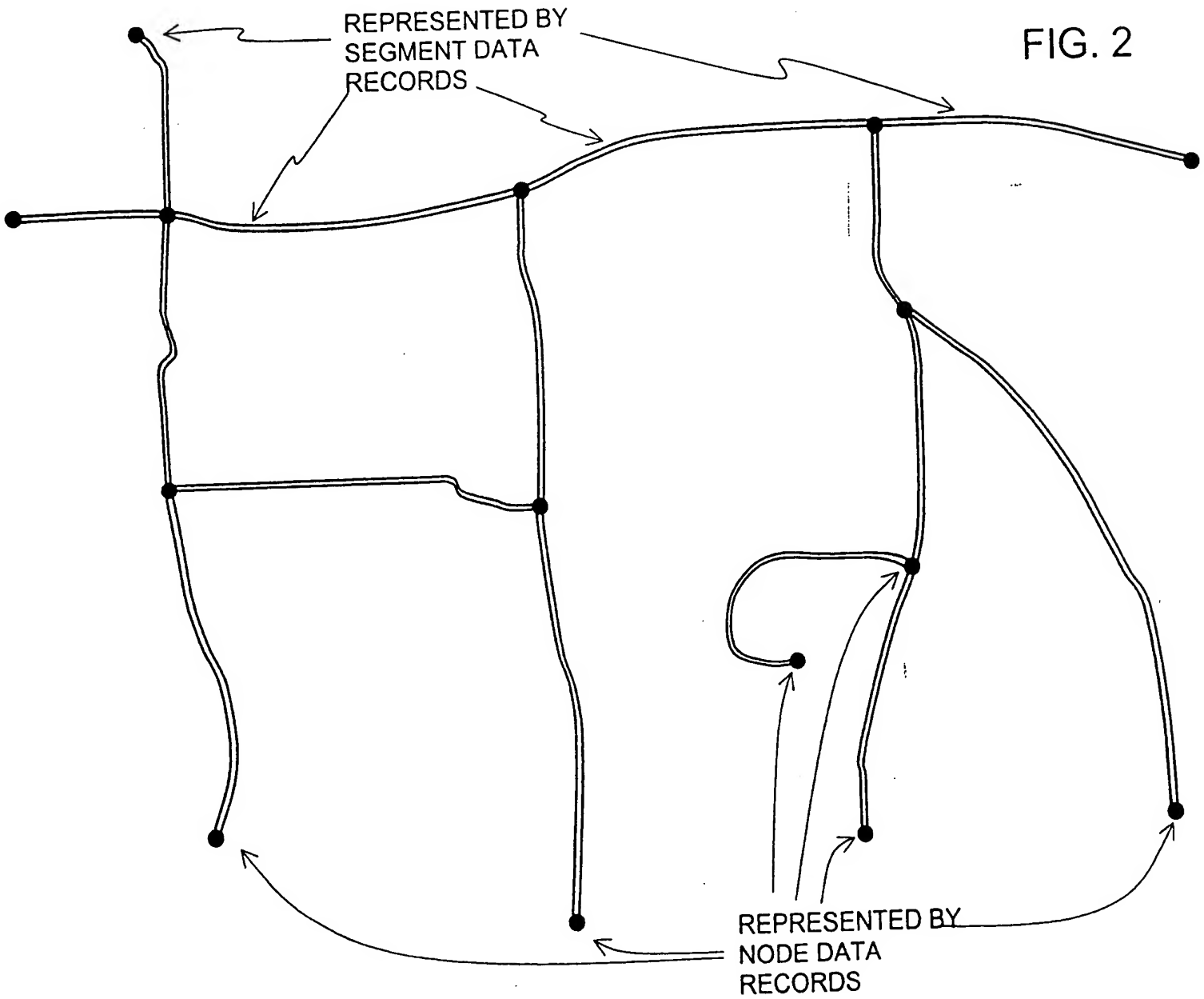

REPRESENTED BY
SEGMENT DATA
RECORDS
REPRESENTED BY
NODE DATA
RECORDS

FIG. 2

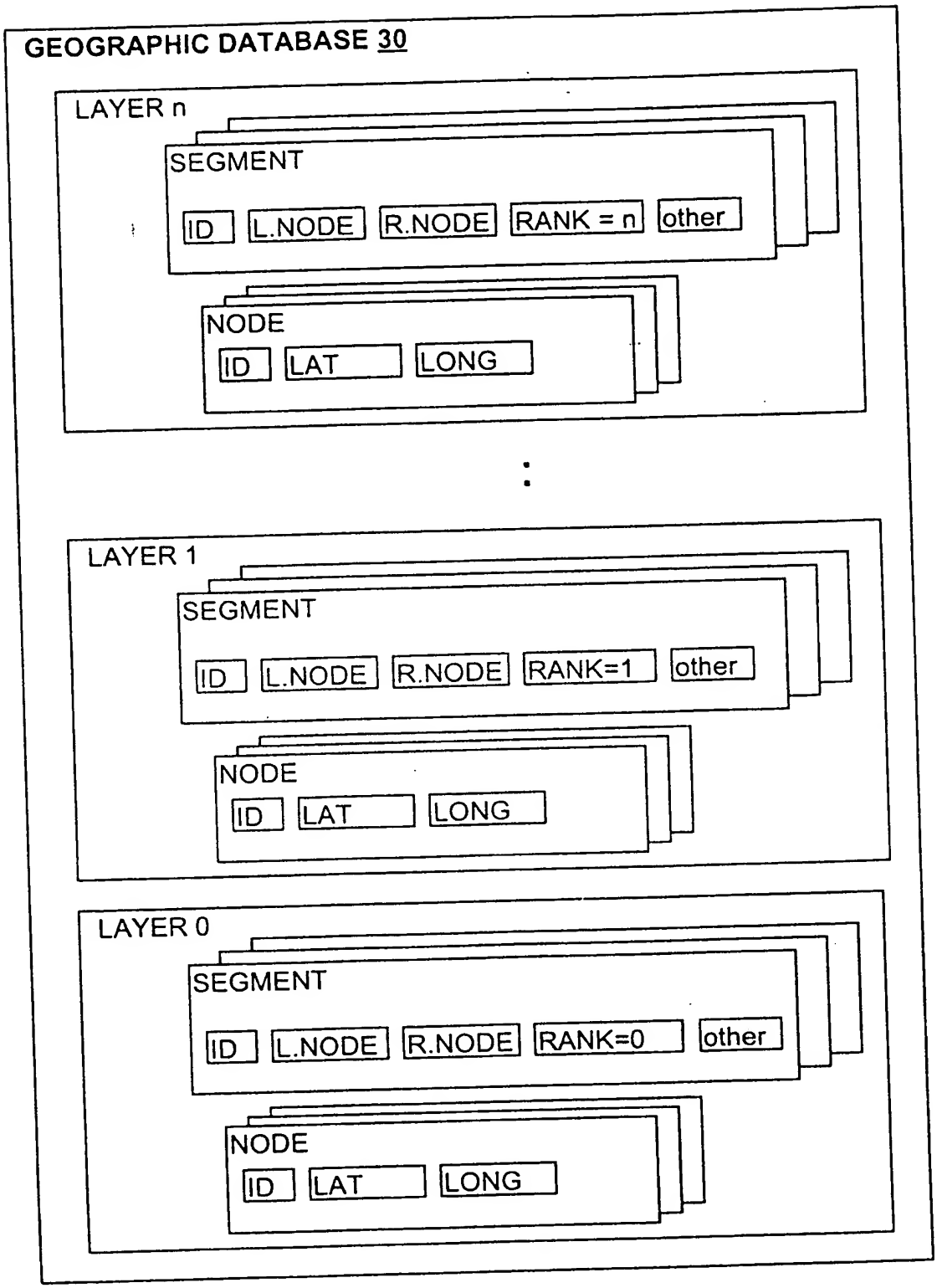

GEOGRAPHIC DATABASE 30
LAYER n
SEGMENT
ID
L.NODE
R.NODE
RANK = n
other
NODE
ID
LAT
LONG
LAYER 1
SEGMENT
ID
L.NODE
R.NODE
RANK=1
other
NODE
ID
LAT
LONG
LAYER 0
SEGMENT
ID
L.NODE
R.NODE
RANK=0
other
NODE
ID
LAT
LONG

FIG. 3

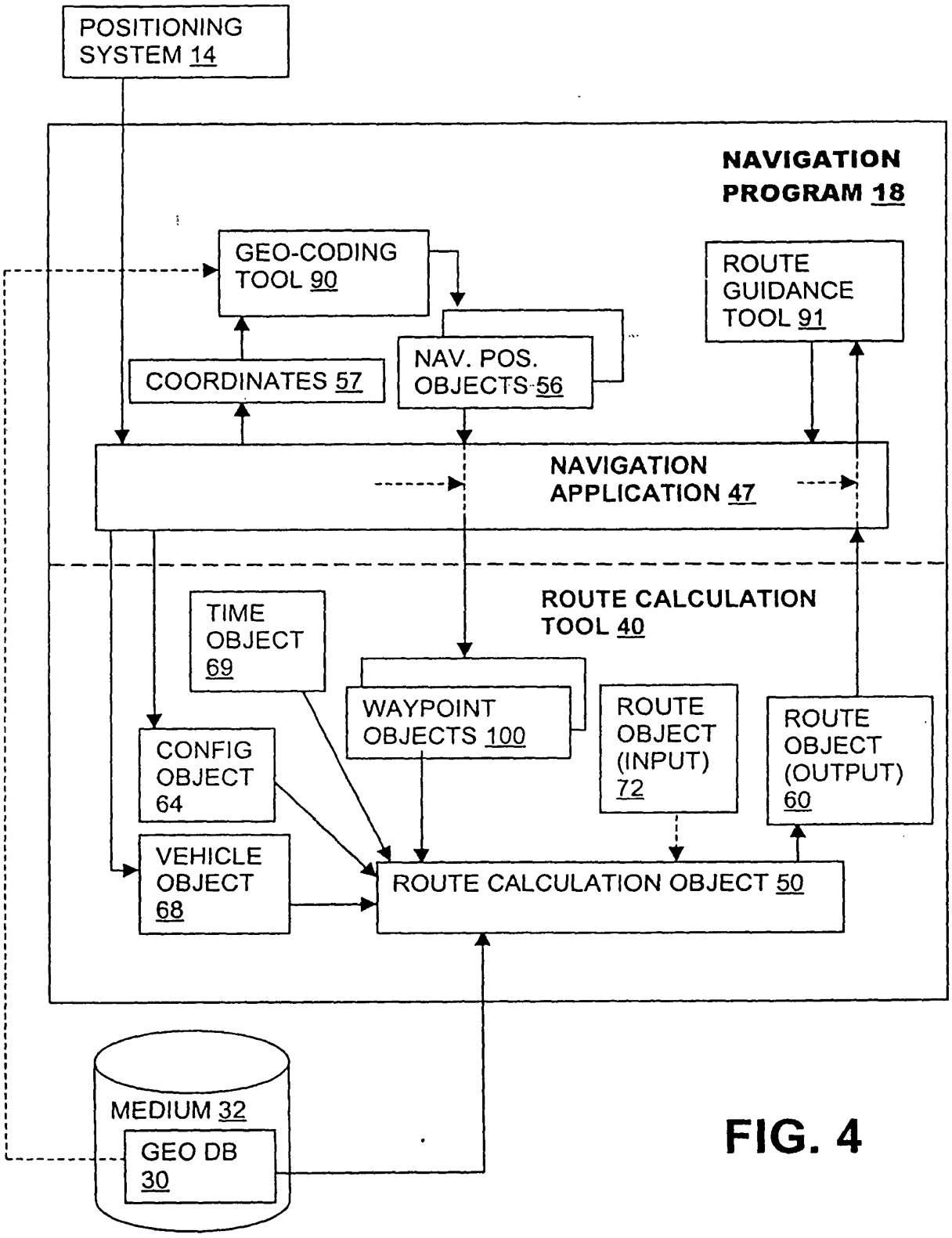

POSITIONING SYSTEM 14
NAVIGATION PROGRAM 18
GEO-CODING TOOL 90
ROUTE GUIDANCE TOOL 91
COORDINATES 57
NAV. POS. OBJECTS 56
NAVIGATION APPLICATION 47
ROUTE CALCULATION TOOL 40
TIME OBJECT 69
WAYPOINT OBJECTS 100
ROUTE OBJECT (INPUT) 72
ROUTE OBJECT (OUTPUT) 60
CONFIG OBJECT 64
VEHICLE OBJECT 68
ROUTE CALCULATION OBJECT 50
MEDIUM 32
GEO DB 30

FIG. 4

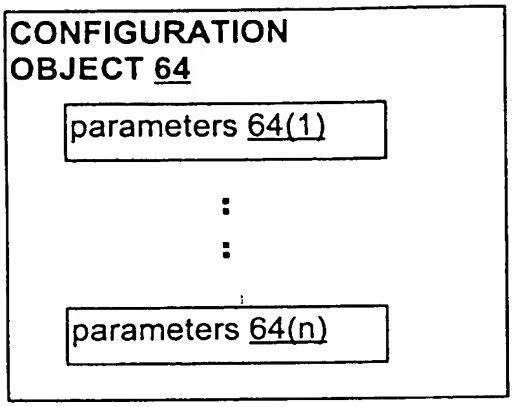


FIG. 5

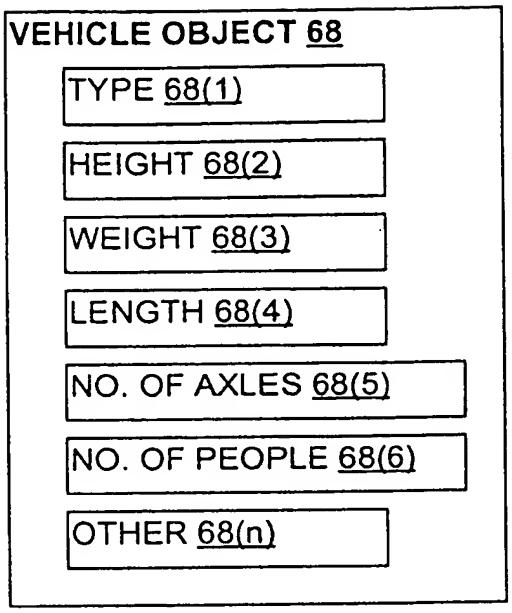


FIG. 6

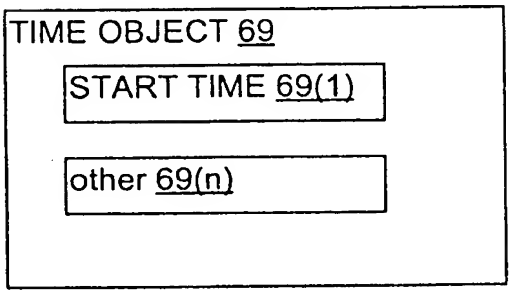


FIG. 8

FIG. 7

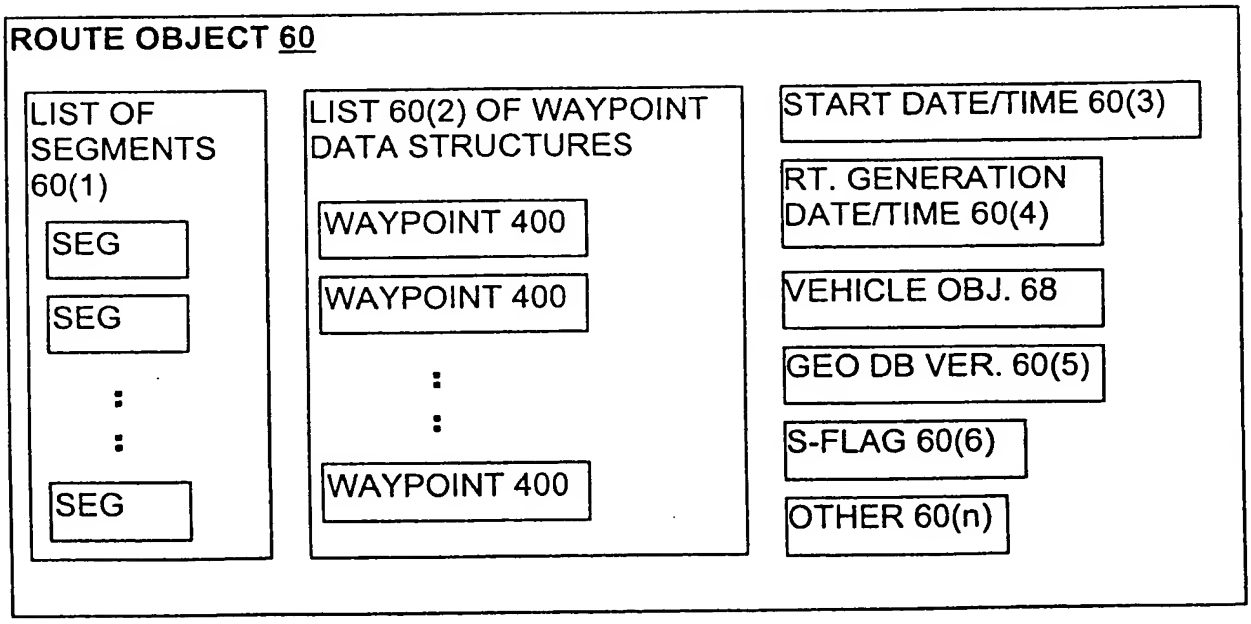


FIG. 9

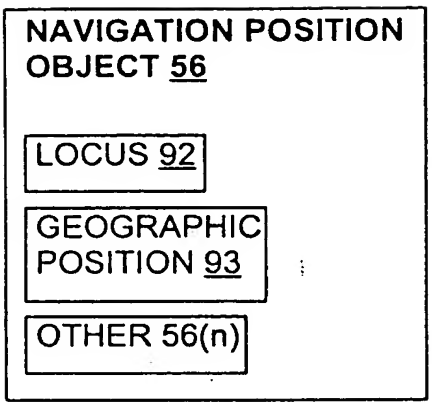


FIG. 10

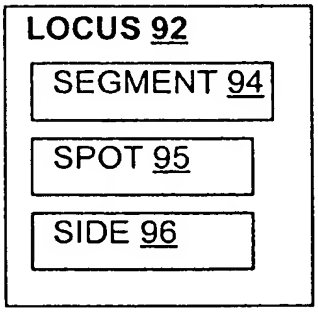
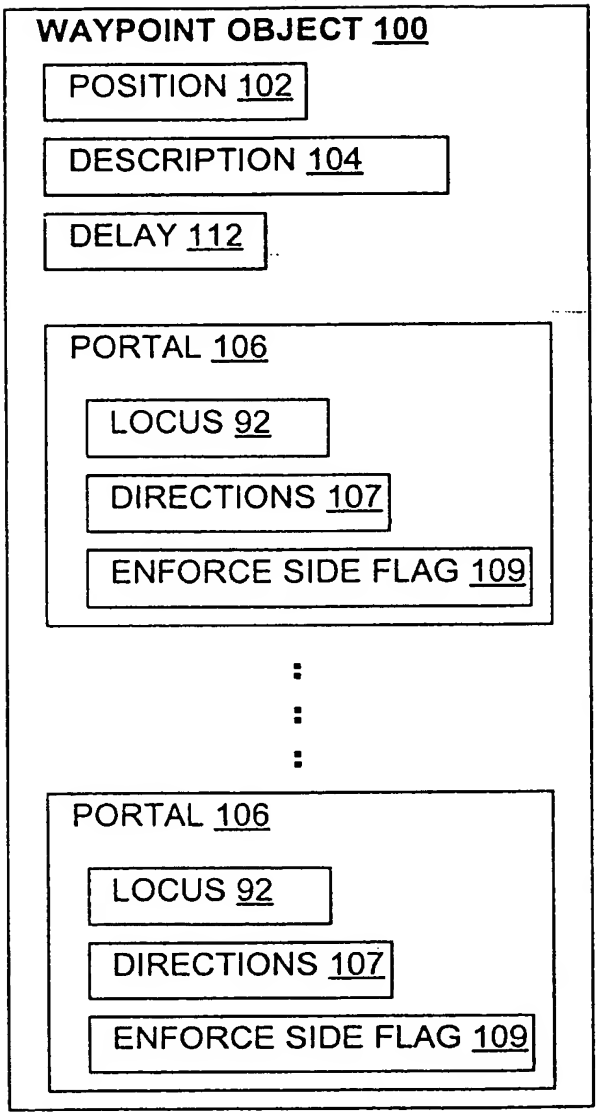


FIG. 11



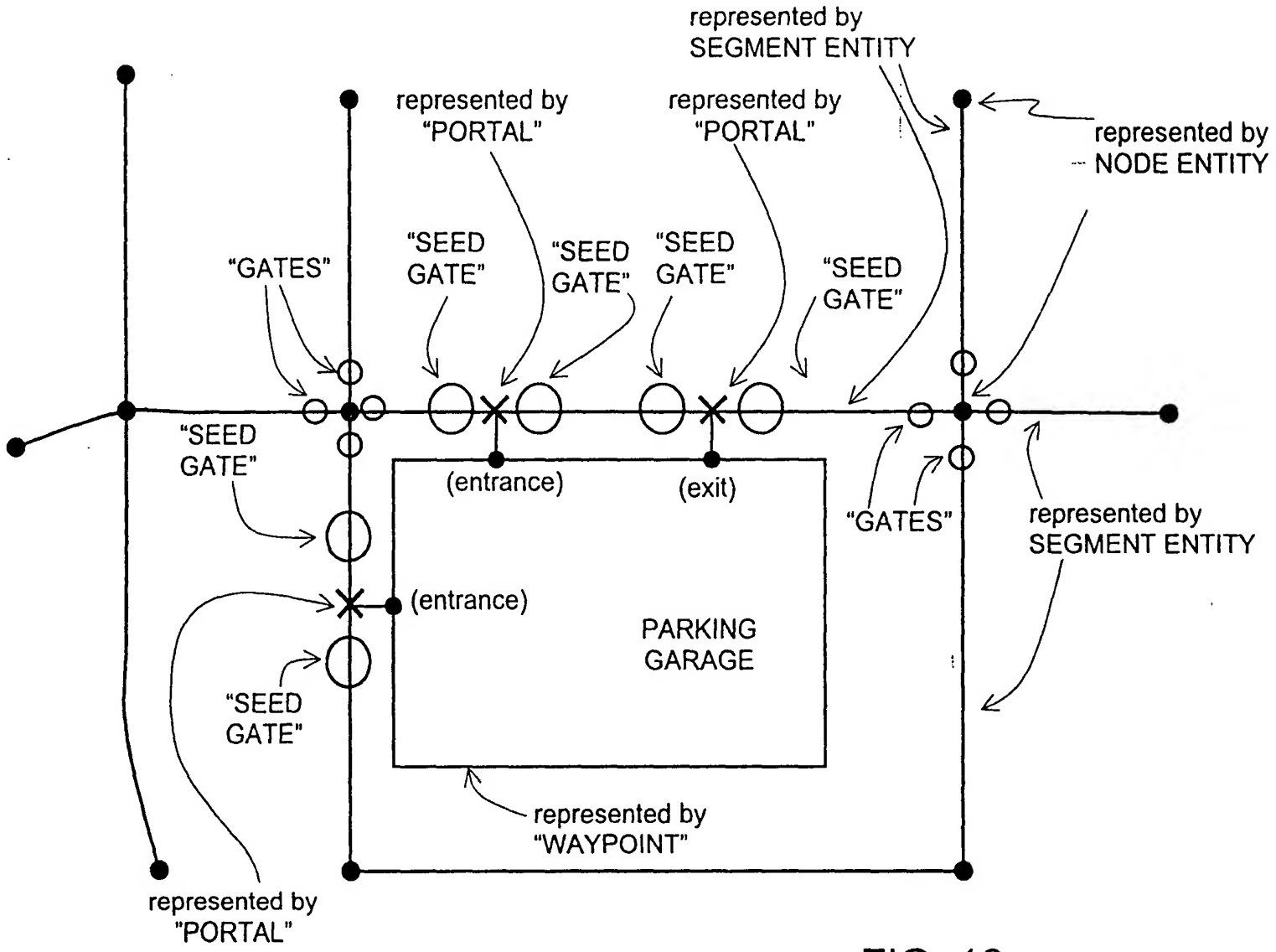

represented by
SEGMENT ENTITY
represented by
"PORTAL"
represented by
"PORTAL"
represented by
NODE ENTITY
"GATES"
"SEED
GATE"
"SEED
GATE"
"SEED
GATE"
"SEED
GATE"
"SEED
GATE"
(entrance)
(exit)
"GATES"
represented by
SEGMENT ENTITY
(entrance)
PARKING
GARAGE
"SEED
GATE"
represented by
"WAYPOINT"
represented by
"PORTAL"

FIG. 12

FIG. 13

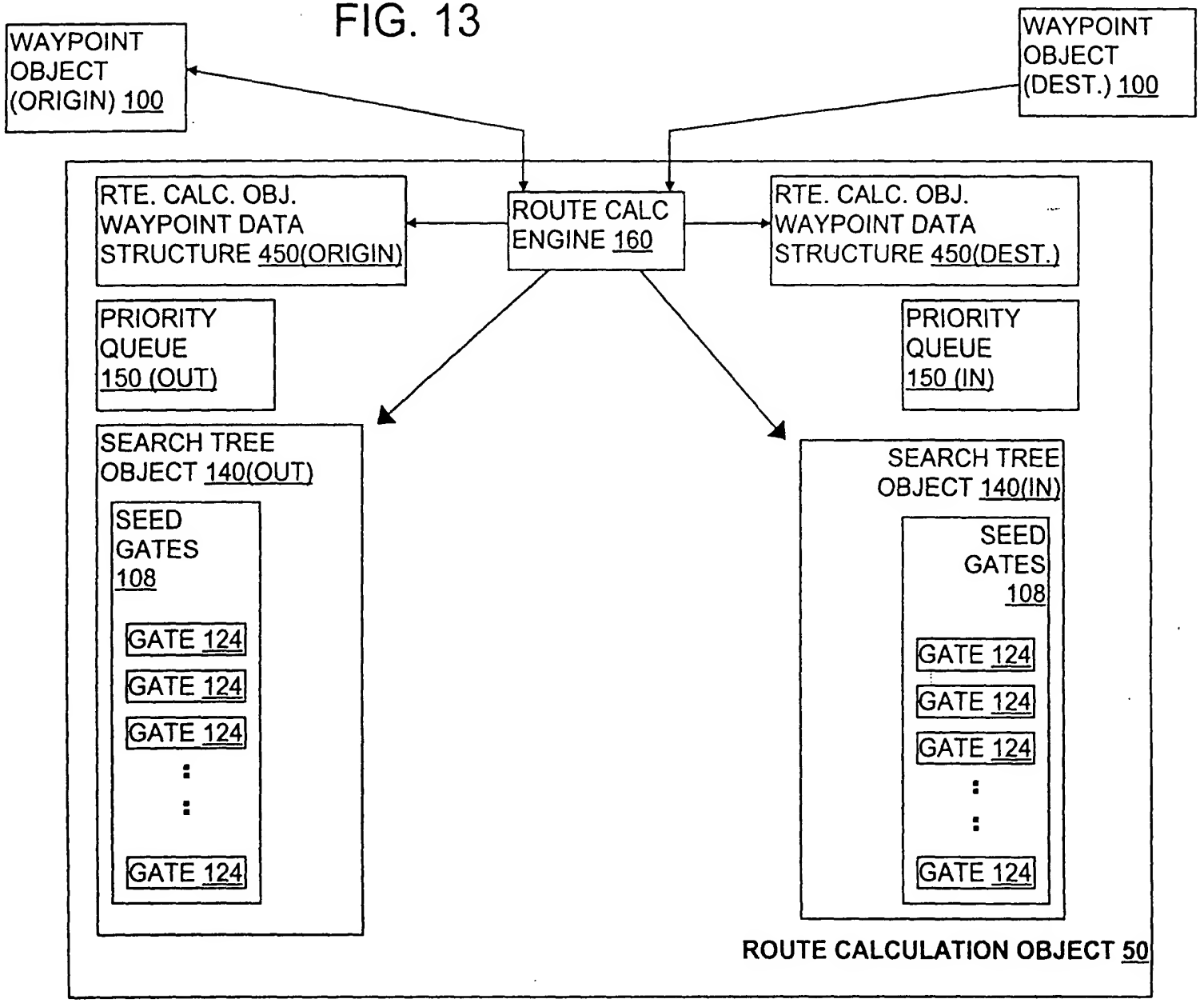

WAYPOINT OBJECT (ORIGIN) 100
WAYPOINT OBJECT (DEST.) 100
RTE. CALC. OBJ. WAYPOINT DATA STRUCTURE 450(ORIGIN)
ROUTE CALC ENGINE 160
RTE. CALC. OBJ. WAYPOINT DATA STRUCTURE 450(DEST.)
PRIORITY QUEUE 150 (OUT)
PRIORITY QUEUE 150 (IN)
SEARCH TREE OBJECT 140(OUT)
SEED GATES 108
GATE 124
GATE 124
GATE 124
GATE 124
SEARCH TREE OBJECT 140(IN)
SEED GATES 108
GATE 124
GATE 124
GATE 124
GATE 124
ROUTE CALCULATION OBJECT 50

FIG. 14

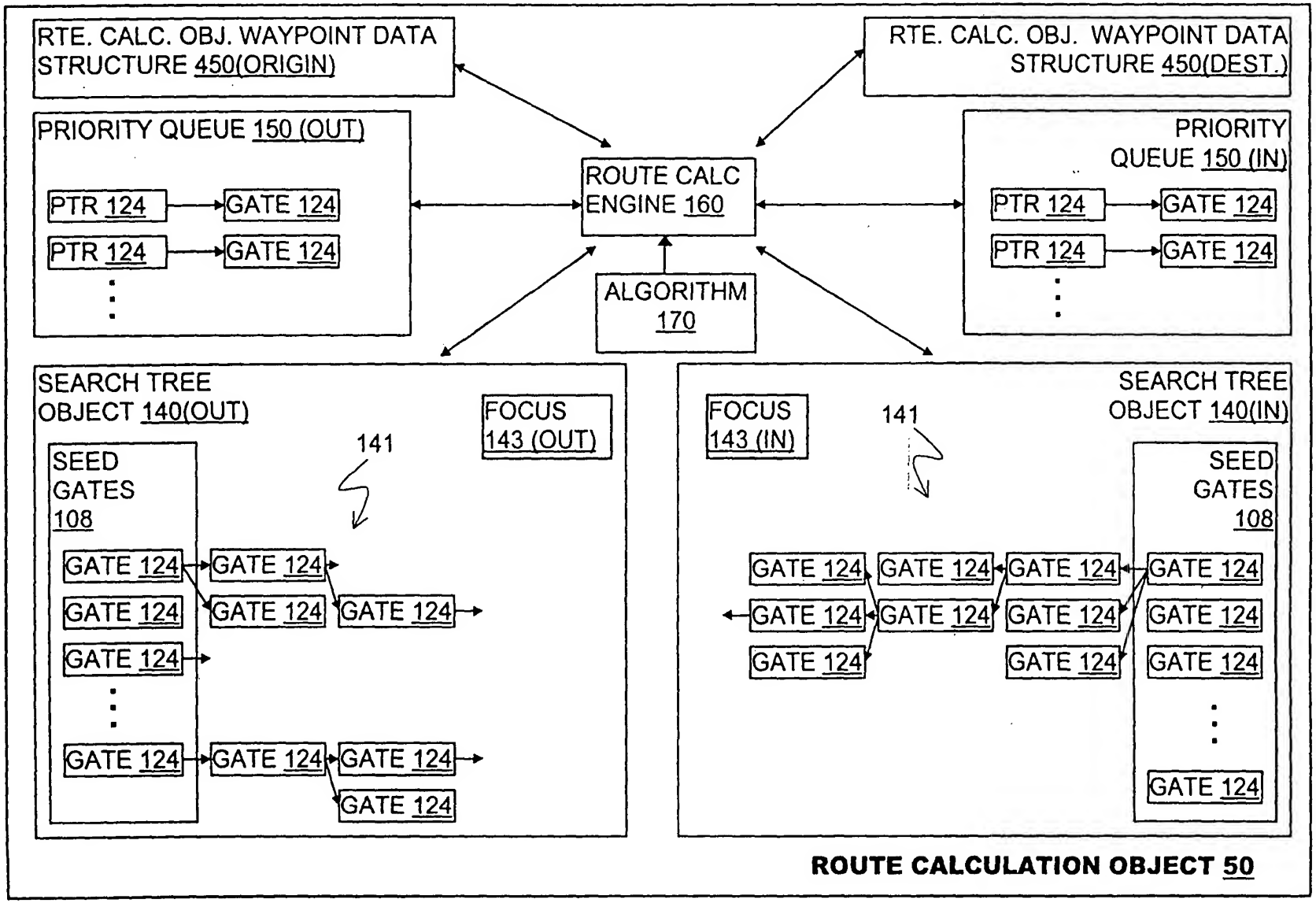

RTE. CALC. OBJ. WAYPOINT DATA STRUCTURE 450(ORIGIN)
RTE. CALC. OBJ. WAYPOINT DATA STRUCTURE 450(DEST.)
PRIORITY QUEUE 150 (OUT)
PTR 124
GATE 124
PTR 124
GATE 124
ROUTE CALC ENGINE 160
ALGORITHM 170
PRIORITY QUEUE 150 (IN)
PTR 124
GATE 124
PTR 124
GATE 124
SEARCH TREE OBJECT 140(OUT)
FOCUS 143 (OUT)
141
SEED GATES 108
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
FOCUS 143 (IN)
141
SEARCH TREE OBJECT 140(IN)
SEED GATES 108
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
GATE 124
ROUTE CALCULATION OBJECT 50

FIG. 15

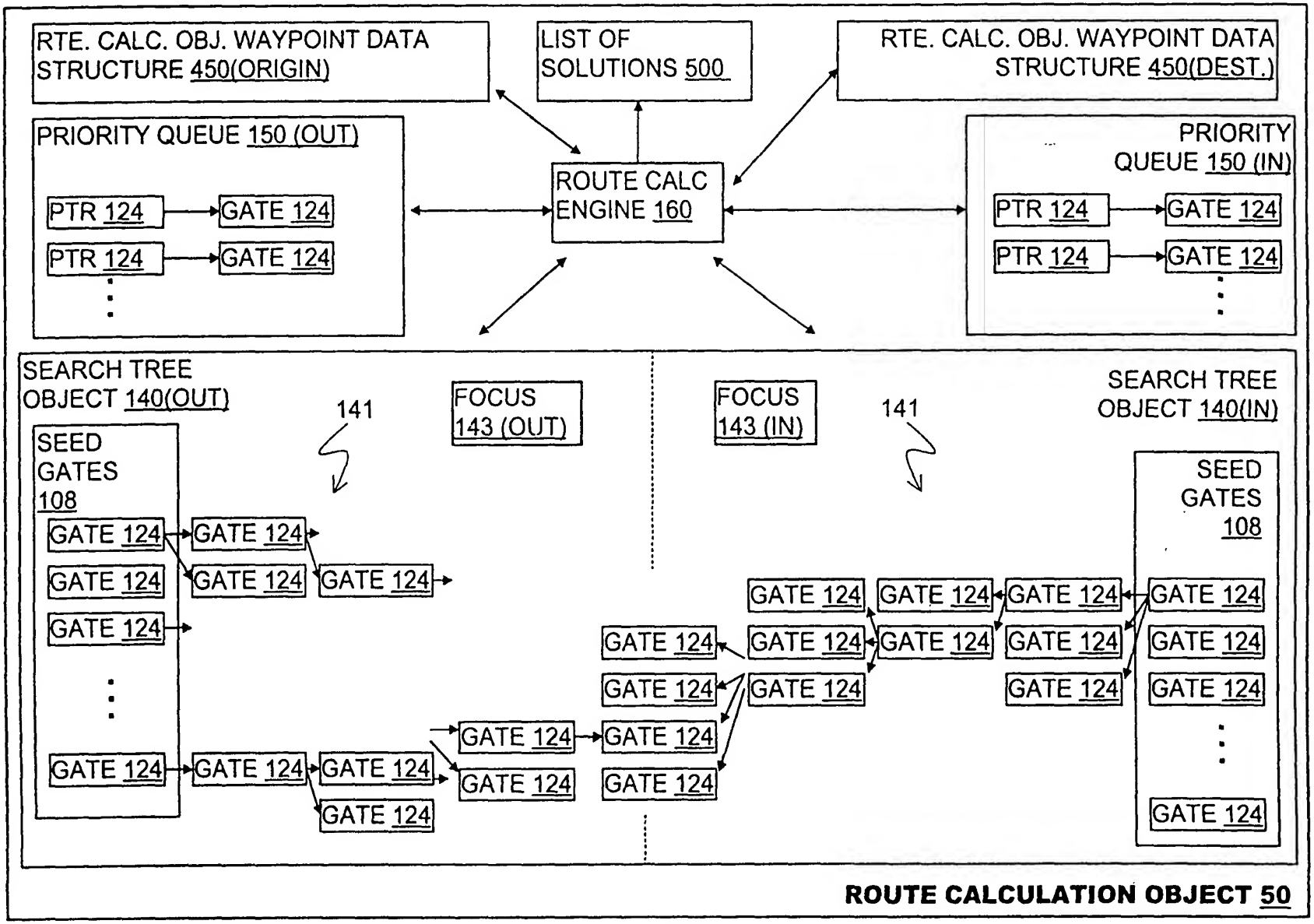
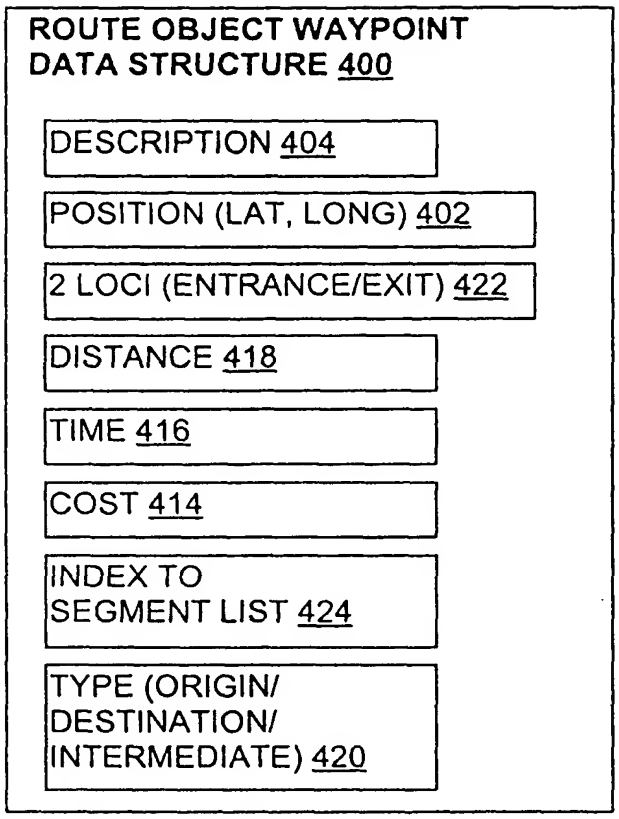

RTE. CALC. OBJ. WAYPOINT DATA STRUCTURE 450(ORIGIN)
LIST OF SOLUTIONS 500
RTE. CALC. OBJ. WAYPOINT DATA STRUCTURE 450(DEST.)
PRIORITY QUEUE 150 (OUT)
PTR 124
GATE 124
PTR 124
GATE 124
ROUTE CALC ENGINE 160
PRIORITY QUEUE 150 (IN)
PTR 124
GATE 124
PTR 124
GATE 124
SEARCH TREE OBJECT 140(OUT)
141
FOCUS 143 (OUT)
FOCUS 143 (IN)
141
SEARCH TREE OBJECT 140(IN)
SEED GATES 108
SEED GATES 108
ROUTE CALCULATION OBJECT 50

FIG. 16



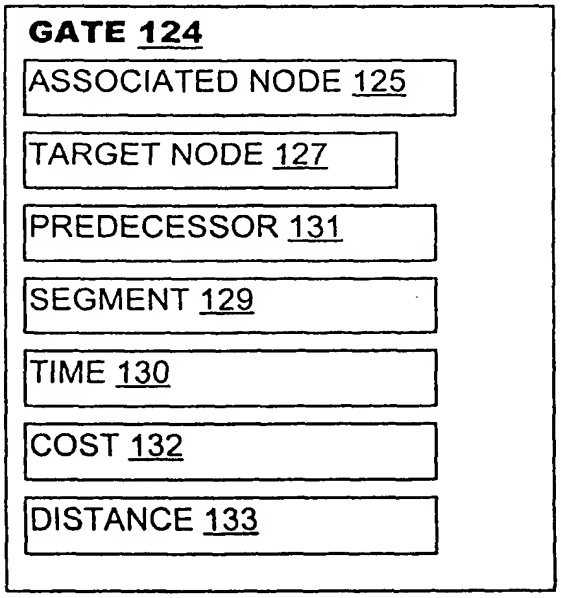
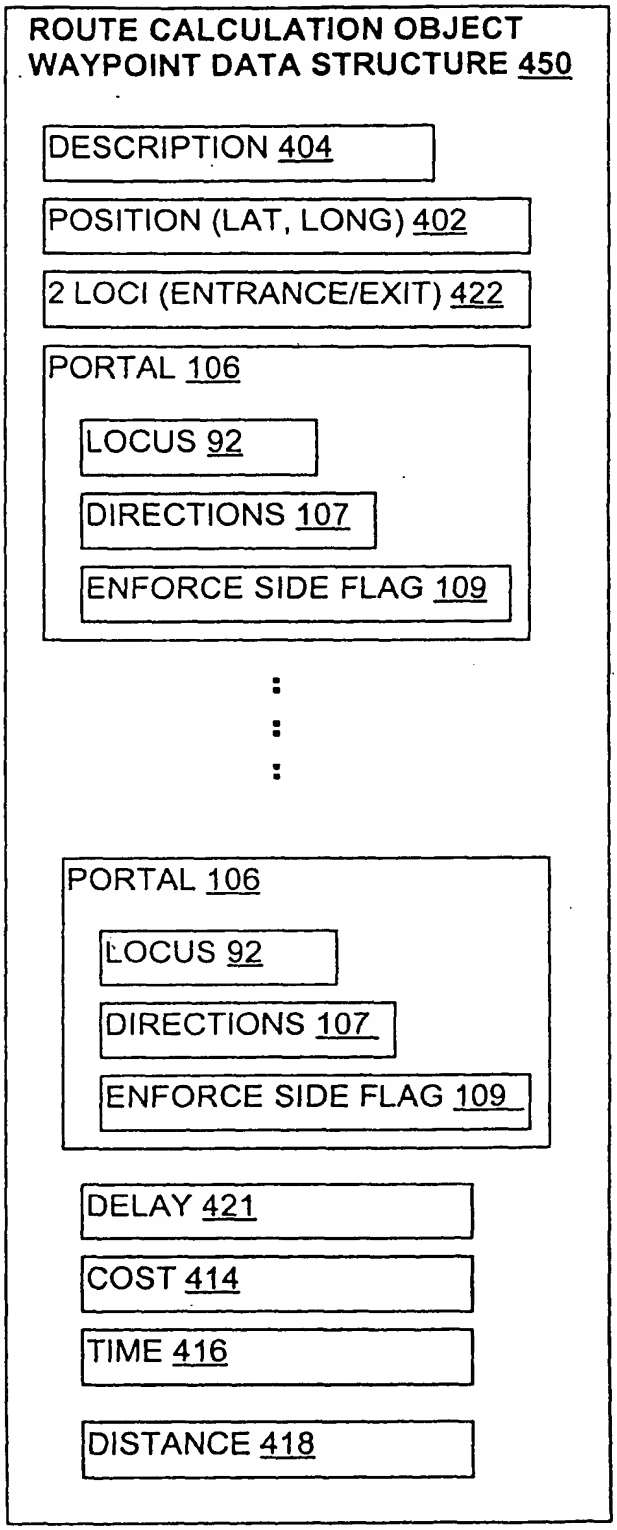


FIG. 17

FIG. 20



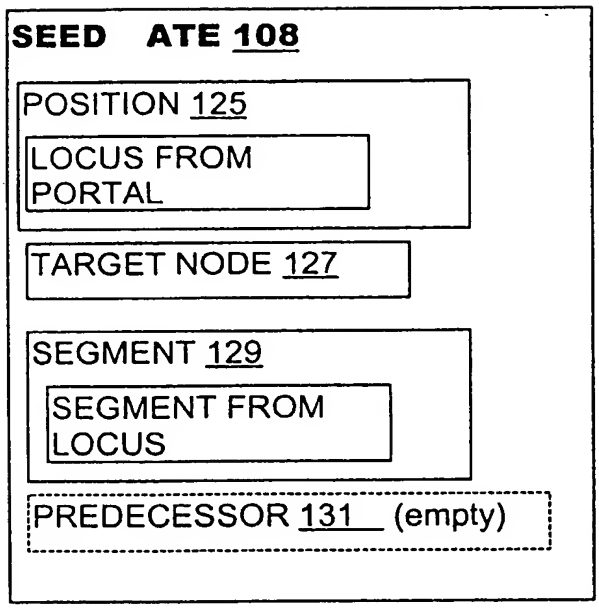

SEED ATE 108
POSITION 125
LOCUS FROM PORTAL
TARGET NODE 127
SEGMENT 129
SEGMENT FROM LOCUS
PREDECESSOR 131 (empty)

FIG. 18

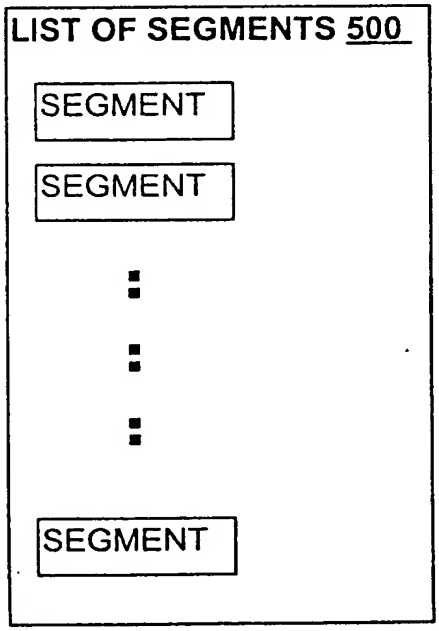
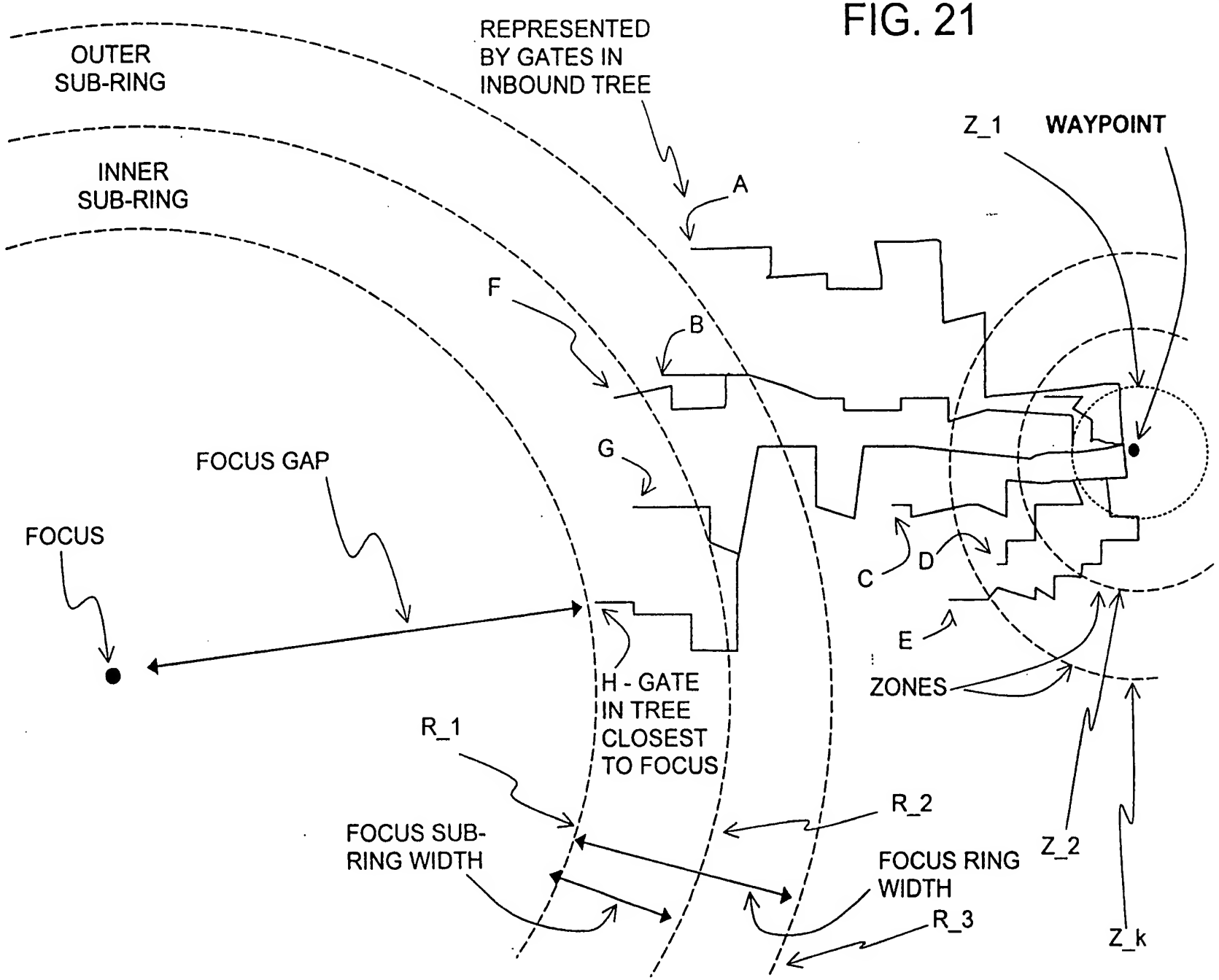

LIST OF SEGMENTS 500
SEGMENT
SEGMENT
SEGMENT

FIG. 19

FIG. 21


OUTER SUB-RING
INNER SUB-RING
REPRESENTED BY GATES IN INBOUND TREE
Z_1
WAYPOINT
A
F
B
G
FOCUS GAP
FOCUS
C
D
E
ZONES
H - GATE IN TREE CLOSEST TO FOCUS
R_1
R_2
FOCUS SUB-RING WIDTH
FOCUS RING WIDTH
R_3
Z_2
Z_k